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# **CDC and HICPAC DRAFT Guideline for Prevention of Surgical Site Infection**

Final Topics for Review  
HICPAC Teleconference  
May 11, 2015

Disclaimer: The findings and conclusions are draft and have not been formally disseminated by the Centers for Disease Control and Prevention and should not be construed to represent any agency determination or policy.

# Topics for Discussion

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- **Methodology Updates**
- **Antimicrobial Sutures**
- **Oxygenation**

# Overall Quality Grades

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- **High**

- Further research is *very unlikely* to change confidence in the estimate of effect

- **Moderate**

- Further research is *likely* to impact confidence in the estimate of effect and *may change* the estimate

- **Low**

- Further research is *very likely* to impact confidence in the estimate of effect and is *likely to change* the estimate

- **Very low**

- Any estimate of effect

# GRADING the Evidence

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- RCTs start high
- Observational studies start low
- Factors lower the quality of evidence
  - Study quality (risk of bias), Limitations, Inconsistency, Indirectness, Imprecision, and Publication bias
- Factors can increase the quality of evidence
  - Large magnitude of effect, Dose-Response, and Confounding

# GRADE Table Example

Comparison	Outcome	Quantity and Type of Evidence	Findings	Starting GRADE	Decrease GRADE					Increase GRADE			GRADE of Evidence for Outcome	Overall GRADE of Evidence Base
					Study Quality	Consistency	Directness	Precision	Publication Bias	Large Magnitude	Dose-response	Confounders		
Q8. What are the most effective strategies for preparing the patient's skin prior to surgery to reduce the risk of SSI?														
Q8A. How safe and effective is preoperative antiseptic bathing or showering?														
Chlorhexidine gluconate (CHG) solution vs. placebo	SSI*	1 SR <sup>69</sup>	<ul style="list-style-type: none"><li>No difference on meta-analysis of 4 RCTs<sup>70, 71, 72, 73</sup> (N=7791) in clean, elective and potentially infected procedures: 356/3906 (9.1%) vs. 389/3885 (10%); RR 0.91 (95%CI, 0.80-1.04).</li><li>No difference on meta-analysis restricted to 2 higher quality RCTs (Byrne<sup>70</sup> and 9547-Rotter<sup>72</sup>) (N=6302): 293/3167 (9.3%) vs. 305/3135 (9.7%); RR 0.95 (95%CI, 0.82-1.10)</li><li>Five months into 1 large study<sup>71</sup> the placebo was found to have antimicrobial properties and was changed but results were not stratified nor excluded.</li><li>No difference in each individual trial</li><li>Number preoperative baths, amount of antiseptic used per bath, bathing instructions to each group, intraoperative antiseptic skin preparation agent, use of AMP, and follow up varied between studies.</li></ul>	High	0	0	0	0	0	0	0	0	High	High
	Product related adverse reactions	1 SR <sup>69</sup>	<ul style="list-style-type: none"><li>No difference on meta-analysis of 2 RCTs<sup>70, 73</sup> (N=3589) 9/1804 (0.5%) vs. 10/1785 (0.6%); RR 0.89 (95%CI, 0.36-2.19).</li><li>Every study used 4% CHG</li><li>Data are driven by the large higher quality RCT<sup>70</sup> as no allergic reactions were reported in either group in the smaller (N=100) lesser quality study.</li></ul>	High	0	0	0	-1	0	0	0	0	Moderate	

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# Formulating Recommendations

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- Three key inputs:
  - Values and preferences used to determine the “critical” outcomes
  - Overall GRADE of the evidence for the “critical” outcomes
  - Net benefits, net harms, or trade-offs that result from weighing the "critical" outcomes
- Recommendations
  - For or against (direction)
  - Strong or weak (strength)

# CDC and HICPAC -Categorization Scheme for Recommendations

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<b>Category IA</b>	A <u>strong</u> recommendation supported by <u>high to moderate quality evidence</u> suggesting net clinical benefits or harms.
<b>Category IB</b>	A <u>strong</u> recommendation supported by <u>low-quality evidence</u> suggesting net clinical benefits or harms, or an accepted practice (e.g., aseptic technique) supported by low to very low-quality evidence.
<b>Category IC</b>	A <u>strong</u> recommendation <u>required by state or federal regulation</u>
<b>Category II</b>	A <u>weak</u> recommendation supported by <u>any quality evidence</u> suggesting a <u>tradeoff</u> between clinical benefits and harms.
<b>No recommendation</b>	An <u>unresolved issue</u> for which there is <u>low to very low-quality evidence</u> with <u>uncertain tradeoffs</u> between benefits and harms.

# ***Review of Methods***

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- **Publication Bias**
  - **Directionality of Studies Reviewed**
  - **Forest Plots Reviewed**
- **Quality Assessments**
  - **Reviewed Individual Study Quality**
  - **Reviewed Aggregate Study Quality**
- **Meta-analyses Review**
  - **Confidence Intervals Reviewed**
  - **Heterogeneity Assessment**
  - **Overall Numbers**



## ***KQ2C. How safe and effective are antimicrobial coated sutures and when and how should they be used?***

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### **December 2014 HICPAC Recommendations to CDC**

- No recommendation for triclosan-coated sutures in superficial or organ closure.
  - This was based on evidence review (Unresolved Issue)
- A strong recommendation for using triclosan-coated sutures in the deep and fascial layers and a weak recommendation was made for deep and fascial closure in all other surgeries.
  - Based on Meta-analyses suggested benefit to using triclosan-coated sutures overall when used in closure of the deep and fascial layers, specifically benefit was shown in colorectal surgeries and no evidence of harms
  - New information affecting this meta-analysis resulted in a re-assessment of these results.

## ***New Information: Author's Reply***

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- ***Triclosan-coated suture (absorbable) vs. non-antimicrobial coated suture (absorbable), Abdominal Fascial Closure***
- Initial study<sup>§</sup> (N=1,185) reported all surgeries as “patients who underwent open abdominal surgery of any kind via elective midline laparotomy”
  - All data considered abdominal surgeries
- Study Author's Reply October 2014\*: sub-analyzed infections by surgeries
  - 690 patients with 122 infections considered abdominal surgeries in the initial analyses were reassigned to colorectal surgeries

<sup>§</sup> Diener MK, Knebel P, Kieser M, et al. Effectiveness of triclosan-coated PDS Plus versus uncoated PDS II sutures for prevention of surgical site infection after abdominal wall closure: the randomised controlled PROUD trial. *Lancet*. 2014;384(9938):142-152.

\* Diener, MK, Knebel, P, Kieser M, et al. Antibiotic sutures against surgical site infections- Author's reply. *Lancet*. 2014;384(9952):1425-6

# Updated Meta-Analyses of SSI for Deep & Fascial Closure: *Triclosan-coated suture (absorbable) vs. non-antimicrobial coated suture (absorbable)*

Comparator N RCT	Amount & Overall Quality of Evidence	N	Odds Ratio	Confidence Interval (95%)	P- value	I <sup>2</sup>
<b>All Surgeries: All SSI*</b>	<b>14 RCT - High</b>	<b>5,303</b>	<b>0.69</b>	<b>(0.55-0.86)</b>	<b>P&lt;0.01</b>	<b>I<sup>2</sup>=28%</b>
<b>Colorectal Surgeries: All SSI*</b>	<b>5 RCT - Moderate</b>	<b>1,912</b>	<b>0.71</b>	<b>(0.47-1.08);</b>	<b>P=0.11</b>	<b>I<sup>2</sup>=48%</b>
<b>Abdominal Surgeries: All SSI*</b>	<b>5 RCT - High</b>	<b>1,208</b>	<b>0.63</b>	<b>(0.42 – 0.95)</b>	<b>P=0.03</b>	<b>I<sup>2</sup>=0</b>
<b>All Surgeries Except Colorectal &amp; Abdominal: All SSI*</b>	<b>9 RCT - High</b>	<b>2,183</b>	<b>0.68</b>	<b>(0.49 – 0.95)</b>	<b>P=0.02</b>	<b>I<sup>2</sup>=24%</b>

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## ***KQ2C. How safe and effective are antimicrobial coated sutures and when and how should they be used?***

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### ***Summary***

- **High overall quality of evidence of benefit across procedures for closure at the deep and fascial layers with absorbable triclosan-coated sutures vs. absorbable non-antimicrobial coated sutures for critical outcome of All SSI**
- **No Evidence of harm**
- **Suture appropriateness and suture selection were not assessed beyond the impact of triclosan-coating.**

## ***KQ2C. How safe and effective are antimicrobial coated sutures and when and how should they be used?***

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### ***Proposed Draft Recommendation***

- **2.C.1.** Use triclosan coated sutures for deep and fascial closure if a triclosan-coated option is available for the suture appropriate to the surgery type and level of closure, and if triclosan is not contraindicated. **(Category IA)** (Key Question 2C)

***KQ6. In patients with normal pulmonary function, how safe and effective is the perioperative use of increased fraction of inspired oxygen (FiO<sub>2</sub>) in reducing the risk of SSI?***

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**December 2014 HICPAC Feedback**

- **HICPAC was in agreement with the data and recommendations presented however HICPAC was in favor of conducting meta-analyses of Draft Guideline data to confirm benefit.**
- **HIPCAC specifically requested a meta-analysis of the colorectal surgery data to determine benefit specifically in this surgery.**

***KQ6. In patients with normal pulmonary function, how safe and effective is the perioperative use of increased fraction of inspired oxygen (FiO<sub>2</sub>) in reducing the risk of SSI?***

Study Level	Comparator	SSI*
5 RCT Moderate	80% oxygen vs. 30% oxygen No nitrous oxide -NO <sub>2</sub> General anesthesia Intraoperative intubation Intraoperative & postoperative administration	<p><b>3 RCT (N=1001) colorectal (n=791) &amp; open appendectomy (n=210) (Belda, Grief, Bickle.)</b>  Each reported a 40% reduction in SSI with 80% oxygen.  Each optimized perioperative tissue oxygen delivery by standardizing patient core temperature regulation strategies targeted at maintenance of normothermia and fluid replacement to avoid hypo or hypervolemia</p> <p><b>1 RCT (N=217 patients with 235 fractures) open reduction &amp; internal fixation of tibial fractures (Stall)</b>  Reported a non-significant 40% reduction in SSI with 80% oxygen  Normothermia and fluid replacement were not described</p> <p><b>1 RCT (N=1,386) general &amp; gynecologic surgical procedures (Meyhoff, Staehr)</b>  No difference  Study did not optimize tissue oxygen delivery: failed to maintain normothermia and instituted aggressive perioperative fluid restriction.</p>

**Meta-Analysis SSI All\* (N=2,604): Moderate Overall Quality Evidence**

**Odds Ratio (95% CI): 0.63 (0.43 – 0.92); p=0.02; I<sup>2</sup>=52%**

***KQ6. In patients with normal pulmonary function, how safe and effective is the perioperative use of increased fraction of inspired oxygen (FiO<sub>2</sub>) in reducing the risk of SSI?***

Study Level	Comparator	SSI*
<b>Colorectal Surgeries</b> <b>3 RCT</b> <b>High</b>	<b>80% oxygen vs. 30% oxygen</b> No nitrous oxide -NO <sub>2</sub> General anesthesia Intraoperative intubation Intraoperative & postoperative administration	<b>2 RCT (n=791) (Belda, Grief)</b> Two reported a 40% reduction in SSI with 80% oxygen. Two optimized perioperative tissue oxygen delivery by standardizing patient core temperature regulation strategies targeted at maintenance of normothermia and fluid replacement to avoid hypo or hypervolemia Both studies extended antibiotics to roughly 48h <b>1 RCT (N=633) (Meyhoff, Staehr)</b> No difference Study did not optimize tissue oxygen delivery: failed to maintain normothermia and instituted aggressive perioperative fluid restriction.

**Meta-analysis SSI All\*: N=1424: Moderate Overall Quality Evidence**

**Odds Ratio (95% CI): 0.64 (0.40-1.04) P=0.07, I<sup>2</sup>=59%**



***KQ6. In patients with normal pulmonary function, how safe and effective is the perioperative use of increased fraction of inspired oxygen (FiO<sub>2</sub>) in reducing the risk of SSI?***

Study Level	Comparator	SSI*
3 RCT Moderate	80% oxygen vs. 30% oxygen Neuraxial anesthesia Intraoperative & postoperative non-rebreathing mask	<p><b>1 RCT (N=831) (Duggal)</b>  <b>Normothermia and volume replacement were maintained</b>            No difference in SSI incidence between groups:            8.2% (34/416) vs. 8.2% (34/415), p=0.89</p> <p><b>2 RCT non-significant increase in SSI with 80% oxygen.</b>  <b>Normothermia &amp; volume replacement were not described</b></p> <p><b>1 RCT (N=143) (Gardella)</b>            SSI: 25% (95% CI, 15-35%) vs. 14% (95% CI, 6-22%); p=0.13.</p> <p><b>1 RCT (N=585) (Scifres)</b>            SSI: 35/288 (12.2%) vs. 26/297 (8.8%), p=0.18</p>

**Meta-analysis SSI Endometritis\*: N=1,559: Moderate Overall Quality Evidence**  
**Odds Ratio (95% CI): 1.62 (0.86-3.05); P=0.14, I<sup>2</sup>=0**

## ***KQ6. In patients with normal pulmonary function, how safe and effective is the perioperative use of increased fraction of inspired oxygen ( $\text{FiO}_2$ ) in reducing the risk of SSI?***

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### **Federal Register Draft Recommendation**

- **6A.** For patients with normal pulmonary function undergoing general anesthesia with endotracheal intubation, administer increased fraction of inspired oxygen ( $\text{FiO}_2$ ) both intraoperatively and post-extubation in the immediate postoperative period. To optimize tissue oxygen delivery, maintain perioperative normothermia and adequate volume replacement. **(Category IA)** (Key Question 6)
- **6B.** RCT evidence suggests uncertain tradeoffs between benefits and harms regarding perioperative increased fraction of inspired oxygen ( $\text{FiO}_2$ ) in patients with normal pulmonary function undergoing either general anesthesia without endotracheal intubation or neuraxial anesthesia (i.e., spinal, epidural, or local nerve blocks) for the prevention of surgical site infection. **(No recommendation/unresolved issue)** (Key Question 6)
- **6C.** RCT evidence suggests uncertain tradeoffs between benefits and harms regarding the administration of increased fraction of inspired oxygen ( $\text{FiO}_2$ ) via facemask or nasal cannula during only the intraoperative period or the postoperative period for the prevention of surgical site infection in patients with normal pulmonary function. **(No recommendation/unresolved issue)** (Key Question 6)

**2008 NICE** “Patient Homeostasis” Maintain optimal oxygenation...sufficient oxygen during major surgery and in the recovery period to ensure that a haemoglobin saturation of more than 95% is maintained. Maintain adequate perfusion and temperature during surgery

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# THANK YOU

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.